

## Description

Device for automatically sorting periodic data records

- 5 The invention relates to a device for automatically sorting periodic data records, in particular for representing the motion of parts in the human body from individual images.
- 10 It is desired in the case of periodic movements of an object to acquire these in an imaging system in the form of many individual instantaneous pictures (images) and to analyze and examine these afterwards in a computer. If the image phases are correctly recorded,
- 15 they can be evaluated subsequently in the appropriate way. However, in many cases they cannot be recorded in correct phase relationship, for example when a periodic process is being recorded stroboscopically without a defined frequency and phase relationship, or when
- 20 individual images of X-ray pictures, in particular of MR pictures, are involved which have been produced without an ECG monitor for the reference points.
- To date, series of images or, very generally, of data
- 25 records, of a periodic process have been arranged only by hand but, in the case of the said example from MR tomography, this causes such an enormous complication that it cannot be implemented in practice.
- 30 It is therefore the object of the invention to create a device for automatically sorting periodic data records in the case of which it is possible to perform sorting even without records in correct data relationship.
- 35 In order to achieve this object, it is provided according to the invention that an examination monitor with a storage device for the data records is assigned a measuring and evaluation device which measures in the

data records two separate points or a line, or the like, of a moving part and, on the basis of their changes in distance or phase shifts, sorts the data records into a cyclic sequence, it being possible for  
5 these cyclically ordered data records then to be combined simply one after another to form a film.

Particularly in the field of technology, it would be possible, for example, for the purpose of measuring the  
10 stress on workpieces such as an engine with pistons to make the latter from a special plastic and photograph them in polarized light, but it can also be expedient in the case of the representation of the motion of parts in the human body to use an input device to  
15 prescribe the waveform on which the periodicity is based, with triangles, rectangles or sinusoidal curves chiefly coming into consideration as waveforms. Specifically in the case of waveforms having at least horizontal rectangular components, it is possible in  
20 the process to determine the frequency distribution of the parameters and to establish therefrom the relative width of the horizontal plateaux.

The invention is to be explained in more detail below  
25 with the aid of the drawing, which shows a diagram with the movement of a point of the left-hand heart valve at the top, and below that to the movement of a point of the right-hand heart valve.

30 Assuming that an MR data record has been made at the instant  $t_1$  and at the instant  $t_2$  (these times themselves not being known), the images of the said point of the left-hand heart valve would be situated wholly at the same point, that is to say the image data  
35 records do not differ here at all from one another, and it is not known whether the movement takes place toward the maximum or away from the maximum further toward the X-axis. This would prevent sorting of the data records

solely on the basis of the measurement of the left-hand heart valve. However, if a point of the right-hand heart valve is also considered at the same time, at the instant  $t_1$  and  $t_2$  the images of this point are very different, that is to say the measurement of two separate points of a moving part, such as the human heart in the present case, renders it possible to sort the data records into a cyclic sequence by the changes in distance or phase shifts.

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